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HYDRO

1947

A brief review of the activities of
The Hydro-Electric Power Commission of Ontario
during the year 1947



Published by
THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO
620 University Avenue, Toronto 2, Ontario
February 3, 1948



DeCew Falls 150,000-horsepower generating station on Twelve Mile creek, near St. Catharines. The second unit, 77,000 horsepower, went into operation in September, 1947.

HYDRO IN 1947

THE REPORT of The Hydro-Electric Power Commission of Ontario for 1947 will be the Fortieth Annual Report.

In 1947 the Commission supplied the greatest load in its four decades of service and substantial progress was made upon the greatest power development program in Hydro history.

The province of Ontario at the present time is in a period of unprecedented expansion affecting industry, commerce and community life generally. In this modern world a movement of this character inevitably means a tremendous growth in the demand for electric power and the province of Ontario is encountering this very experience. The Commission, therefore, has made, and is making, every effort to meet the challenge of the times, and at this significant turning point in its history moves forward with confidence and vigour upon a fifth decade of public service to the people of Ontario.

Reorganization

WHEN IT became evident that Hydro was faced with this great expansion program the Commission late in 1946 reviewed broadly the adequacy of the existing organization to serve effectively the co-operating municipalities and its direct customers, while concurrently dealing with the multitude of technical problems involved in an expansion program.

In February 1947 the matter was further explored upon a three-fold basis, comprising: (a) The general administrative organization, (b) Certain engineering problems, (c) Certain financial problems, and it was decided to secure the services of independent authorities to review, in co-operation with officials of the Commission, the associated problems relating respectively to administration, engineering and finance.

Administration

It was decided to retain J. D. Woods & Gordon, Limited, industrial consultants to report upon the general administrative organization and to make recommendations regarding an appropriate plan, indicating the principal positions to be filled, the relationship and sub-division of duties, the functions and personnel of the various departments, lines of authority, definition of duties, a review of the methods to be followed in statistical recording, and the adequacy for control purposes of reports and other data.

Engineering

The Stone & Webster Engineering Corporation was retained to report upon three main problems:

- (1) The present and future sources of power, probable demands, types of power, the desirability of augmenting for certain areas hydro-electric development by steam or other auxiliary units.
- (2) The proposed frequency change, with an assessment of advantages, review of estimated costs and particularly the timing of any changes and program that might be suggested.
- (3) New sources of power for short-term requirements and related development of new power sites.

Finance

The Commission retained Mr. G. T. Clarkson of Clarkson, Gordon & Co., to advise upon finance problems, reviewing particularly:

- (1) The problems involved in the financing of any program for the standardization of frequency, and
- (2) Possible modifications of present practices regarding basis of determining costs of power, the financing of rural expansions and the position of Hydro reserves.

The final reports on engineering and finance are not yet available, but interim recommendations respecting administration were made during 1947 and a large measure of re-organization has already been effected.

The plan of organization recommended by the consultants and accepted by the Commission covers three main functions, policy making, policy interpretation and action. It provides all supervisors with authority to take prompt and decisive measures on any matters within their range of administrative duties.

Regional Offices

A feature of the re-organization of particular interest to the municipalities is the division of the Province into nine regions and the setting up of regional offices in London, Hamilton, Niagara Falls, Toronto, Barrie, Belleville, North Bay, Ottawa and the North Western Region. These offices are in effect nine miniature head offices and will be under the direction of regional managers charged with the responsibility of administering the day-to-day activities and policies of the Commission within their respective regions, excluding engineering and construction projects.

Each regional manager has reporting to him a number of area managers, whose activities heretofore have been confined to the operation and maintenance of rural distribution systems, but whose responsibility now is to deal expeditiously with any problems arising in their respective areas.

The regional managers are responsible for the operation and maintenance of all Commission properties and for all matters pertaining to consumer relations within their respective regions and it is believed that the adoption of a decentralized type of administration will afford many advantages to the municipal and other customers.

Power Development

SINCE 1945 the Commission has been engaged in implementing the power development program for which plans were started before the termination of the war. During the past year, however, the Commission again found it necessary to revise its plans to cope with the ever-increasing magnitude of prospective demands.

The total power resources available to the Commission in 1947 including its own generating plants and the purchased power contracts, aggregated 2,050,000 kilowatts (2,748,000 hp). The power plants authorized for construction (with an additional power purchase contract) will add during the next few years a capacity of 704,000 kilowatts (943,000 hp) making a total of 2,754,000 kilowatts (3,691,000 hp) as shown on the accompanying table.

Commission's Available Power Resources—All Systems

	<i>Kilowatts</i>	<i>Horsepower</i>
Maximum normal plant capacity (including DeCew Falls second unit placed in service in September 1947).....	1,338,000	1,793,000
Power purchased (contract amount).....	712,000	955,000
	2,050,000	2,748,000
New projects as tabulated below.....	704,000	943,000
Total.....	2,754,000	3,691,000

Authorized Construction

<i>System and development</i>	<i>Kilowatts</i>	<i>Horsepower</i>
SOUTHERN ONTARIO SYSTEM		
Stewartville—Madawaska river.....	60,000	80,000
Des Joachims—Ottawa river.....	358,000	480,000
Chenau—Ottawa river.....	119,000	160,000
	537,000	720,000
THUNDER BAY SYSTEM		
Aguasabon—Aguasabon river.....	40,000	53,000
Pine Portage—Nipigon river.....	60,000	*80,000
	100,000	133,000
NORTHERN ONTARIO PROPERTIES		
Ear Falls—English river.....	5,500	7,500
Tunnel Site—Mississagi river.....	42,000	56,500
	47,500	64,000
ADDITIONAL POWER PURCHASE CONTRACT		
Polymer Corporation—Sarnia.....	19,500	26,000
Total.....	704,000	943,000

*Hydraulic structures and powerhouse for 4 units. Initial installation 2 units, ultimate capacity 4 units = 160,000 hp.

In addition to the developments included in this table there are other hydro-electric and steam plant projects receiving close study for integration into the general expansion program; these, would provide over 250,000 kilowatts (330,000 hp) of additional capacity.

The total estimated cost of engineering projects approved by the Commission now stands at nearly \$320,000,000. They may be grouped as follows:

Summary of Projects Under Construction or Authorized

Including DeCew Falls now completed.

For power generation: Hydraulic.....	\$103,812,000	
Electrical.....	34,435,000	\$138,247,000
For high-voltage transmission facilities.....		\$46,019,000
For high-voltage transformers, switching and frequency-changer station facilities.....		46,861,000
Total for main projects.....		\$231,127,000
In addition there are a large number of approved projects, many of substantial magnitude relating to certain rehabilitation of plants, modernizing of equipment, improvements to transmission and distributing equipment and further new installations, etc. These approved projects aggregate in value about.....		88,471,000
A total of.....		\$319,598,000

It will, of course, be understood that this program of capital expenditure extends over a period exceeding five years. Of this total about \$75,000,000 had been expended to December 31, 1947.

The 1947 capital construction budget of the Commission contemplated expenditures of over \$57,000,000. However, due to deficiencies in the available supply of both labor and materials and other problems attendant on a program of this magnitude, actual expenditures for the fiscal period were only \$46,000,000 or 80 per cent of the budget objective. This expenditure greatly exceeds the amount spent on capital construction in any year since the building of the Queenston-Chippawa development.

Progress on Developments

Activities in connection with new projects and improvements to and rehabilitation of existing generating stations and transmission and distribution facilities have been so numerous that only a brief reference to the larger projects may be made within the compass of this review.

With respect to the new hydro-electric developments actual construction has proceeded on four major developments and two extensions, and on access roads and camps at two others. Field investigations including surveys and office studies were



Construction activity at the Des Joachims project on the Ottawa river. Ultimate capacity, 480,000 horsepower. *Above*—General layout of the camp.
Below—Conveyor for transmitting concrete aggregates.



active on two other developments. At several power plants and storage developments now in use improvements and repairs were being made.

During 1947 the increased construction program created a substantial volume of work in the acquisition of land and rights of various kinds for hydraulic developments, transformer stations, transmission lines, etc., for which surveys and other field work, the preparation of plans, the study of assessment and taxation problems and official recording have been required. The policy of contacting owners of private property before commencing survey work has been carried out as far as possible to the benefit of both property owners and the Commission.

The following paragraphs summarize the main features of the hydro-electric developments under construction.

Southern Ontario System

DECEW FALLS 25-CYCLE GENERATING STATION—Niagara district.

Placed in service—September 26, 1947

Capacity—57,000 kilowatts (77,000 hp)

Head developed—280 feet

Estimated cost—\$7,700,000

The extension involved many new works including enlargement of storage reservoirs, relocation of roads and construction of three highway bridges

STEWARTVILLE GENERATING STATION—Madawaska river

In service—September, 1948

Capacity—60,000 kilowatts (80,000 hp)

Head—148 feet

Estimated cost—\$10,500,000

In this development the largest part of the work is in the building of the dam, a gravity type structure 200 feet high, spanning the main river channel. Progress is satisfactory, on both the main dam and powerhouse.

DES JOACHIMS GENERATING STATION—Ottawa river

In service—Four units in 1950, four units in 1951

Capacity—8 units, 358,000 kilowatts (480,000 hp)

Head—130 feet

Estimated cost—\$57,600,000

This development is the largest project in progress, and at present there are more than 2,000 men employed at the site. The main dam will span the three channels of the river between islands at the rapids and will create slack water in the Ottawa river for a distance of fifty miles upstream from the dam almost to Mattawa. The powerhouse will be built in the inter-provincial channel of the river near Des Joachims village. About three and a half miles to the northwest of the main dam, the McConnell lake dam is being built. This spans a low divide and will discharge flood waters into McConnell lake whence they will pass by a wide valley to the Ottawa river below the tailrace of the dam. The McConnell lake dam is being built by the Atlas Construction Co. under the general supervision of the Commission's engineering staff.

CHENAUX GENERATING STATION—Ottawa river.

In service—Six units in 1951, two units in 1952

Capacity—119,000 kilowatts (160,000 hp)

Head—40 feet

Estimated cost—\$25,000,000

Only preliminary surveys and investigations have been made at this site. Office studies of various design features are being made. The designing and planning work for this development has been contracted to H. G. Acres & Co. of Niagara Falls and tenders for the construction work are now being called for. The assignment of work to outside engineering and construction companies is necessary as the facilities of the Commission's own enlarged engineering and construction departments are fully employed.

Thunder Bay System

AGUASABON GENERATING STATION—

In service—September 1948

Capacity—40,000 kilowatts (53,000 hp)

Head—290 feet

Estimated cost—\$8,511,000

The powerhouse of this development is on the shore of Terrace bay on lake Superior about 70 miles east of the Nipigon river. Work on the main dam and other structures is proceeding favourably.

PINE PORTAGE GENERATING STATION—Nipigon river.

In service—Two units December 1950

Initial capacity—60,000 kilowatts (80,000 hp)

Ultimate capacity—120,000 kilowatts (160,000 hp)

Head—105 feet

Estimated cost—\$20,000,000

Preliminary work on access roads, camp buildings and services is in process. Transportation to the site has been difficult but has been accomplished by use of sleighs and four-wheel drive tractors.

Northern Ontario Properties

TUNNEL GENERATING STATION—Mississagi river.

In service—Early 1950

Capacity—42,000 kilowatts (56,500 hp)

Head—210 feet

Estimated cost—\$13,800,000

The contract for the construction of this station has been let to Rayner Construction Limited, and work on this development began in September, 1947.

EAR FALLS GENERATING STATION (EXTENSION)—English river.

In service—June 1948—Fourth unit

Capacity—5,500 kilowatts (7,500 hp)

Head—36 feet

Estimated cost—\$1,200,000

The construction schedule is being well maintained.

Scarborough Frequency-Changer No. 1

BECAUSE of the extraordinary increase in the load of the Georgian Bay division it was decided in August 1945 to provide additional power by the installation of a 25,000-kva 25-60 cycle frequency-changer adjacent to Toronto with the necessary voltage transformation and 110-kv transmission line connections joining the Niagara, Eastern Ontario and Georgian Bay divisions of the Southern Ontario system by July 1, 1947.

During the period this work was being done, staff was in short supply and equipment was difficult to obtain. Diversion of men and equipment was made from certain less urgent work and manufacturers' schedules were changed. With close attention and the co-operation of all parties concerned this project was constructed according to schedule and despite many attendant difficulties the frequency-changer was tested out on July 2, 1947, and placed in operation a few days later in time to meet the peak load requirements of the Georgian Bay division. Credit is due to the engineering and construction staff of the Commission for this excellent performance.

Operating Conditions

Increased Generating Capacity

On September 26, 1947, the first of the Commission's major post-war projects, the second 25-cycle unit at the DeCew Falls generating station, was officially brought into service adding 57,000 kilowatts (77,000 horsepower) to the power resources of the Southern Ontario system. The total normal operating capacity of the 53 generating plants of the Commission at the end of 1947, including the new DeCew Falls unit, was 1,338,000 kilowatts (1,793,000 hp).

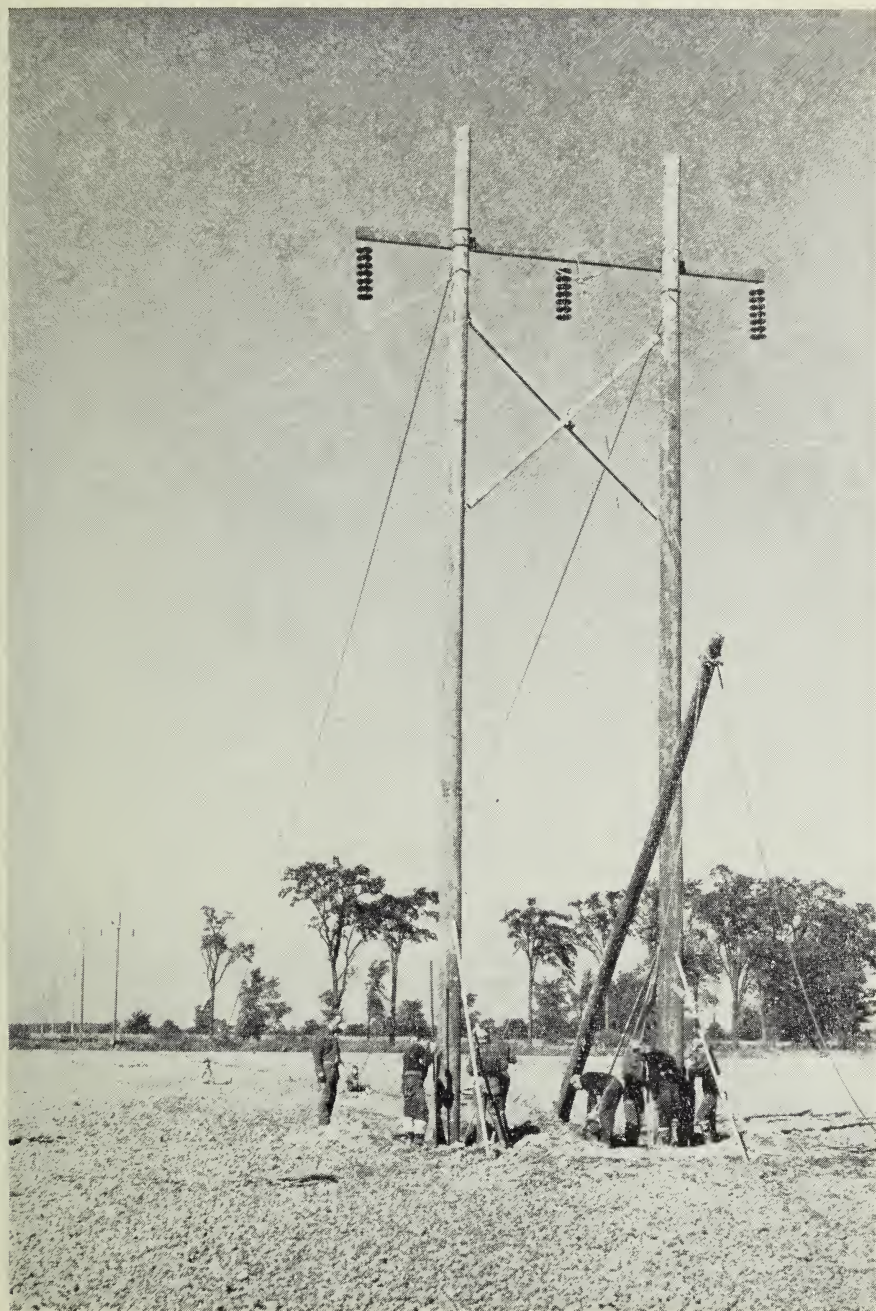
Helpful Co-operation from Quebec

Almost continuously throughout the year the Commission took delivery of surplus power whenever and wherever available. Under special arrangements approximately 617,000,000 kilowatt-hours were purchased during the year in excess of the amounts provided for in the main contracts with the Quebec power companies. In this connection the Commission records appreciation for the helpful co-operation given by the Department of Transport, Ottawa, the Government of the Province of Quebec, Quebec Hydro-Electric Commission, Gatineau Power Company, MacLaren-Quebec Power Company, Beauharnois Light, Heat & Power Company and the Ottawa Valley Power Company.

In 1947 there was no change in the contract amounts for purchased power.

Failures of Equipment

In December, 1946, a sleet storm of unusual severity caused heavy icing of the transmission circuits in the Niagara peninsula where 137 towers on two of the 44,000-volt lines between DeCew Falls and the city of Hamilton collapsed under the icy weight of the conductors. The damaged circuits were restored to normal service on March 1, 1947.



Erecting twin-pole structure on 110,000-volt transmission line in the vicinity of Essex.

On June 17, 1947, service to a major portion of the Niagara division was disrupted when the total power supply from Quebec sources failed, following a disturbance on the 220,000-volt network. It was necessary to interrupt service to Toronto area customers, and to some western-area customers for periods up to 15 minutes, in order to restore normal operating conditions. On June 25, a similar break-down occurred. In each case the trouble was caused by an explosion in a municipal dump.

The restoration of a complex network, such as that involved in this trouble, is a most difficult situation to handle. It is only by the complete co-ordinated effort of the operating staff, each man doing his integral part with sound judgment and with all possible speed, that a collapsed power system can be restored to normal. Too much praise cannot be given to the operating staff for the manner in which restoration of service was made.

Precipitation and Storage

The principal storage reservoirs throughout the Province were below normal levels on entering the 1946-47 winter season. However, improved early winter inflows particularly in the northern areas and a generally heavy snow cover combined to brighten the picture as spring 1947 approached. Throughout the spring and early summer above-normal precipitation and stream flows persisted until the end of July.

During the late summer and early autumn of 1947 precipitation in most sections of the Province was much below normal and by the end of October the water situation was generally unfavourable and in some northern areas was serious. Thus, notwithstanding the favourable outlook in the spring, overall water conditions throughout the Province on entering the 1947-48 winter season were poor, even worse than those at the same time in the previous year, and in the north-eastern section winter water levels reached their lowest recorded elevation in over 13 years.

Load Conditions

Power Demands Exceed Resources

Combined demands for power on the Commission's systems reached levels never before attained. They exceeded the Commission's available resources especially on the Southern Ontario system where it was necessary to curtail deliveries of power to industrial consumers.

The total peak output on the combined systems was 2,056,000 kilowatts (2,755,000 hp), exceeding the record output of the previous year by 97,500 kilowatts (130,000 hp), or 5 per cent. The total energy output from all generated and purchased sources amounted to 13,654,857,750 kilowatt-hours. This was 983,000,000 kilowatt-hours or 7.8 per cent greater than the production during the previous fiscal year.

Primary Demand

The maximum primary peak demand (actual load plus cuts) for the fiscal year occurred in October and was estimated to be 2,169,700 kilowatts (2,908,000 hp), as compared with 1,962,000 kilowatts (2,630,000 hp) in the previous October. This was an increase of 207,700 kilowatts (278,500 hp) or 10.6 per cent. The total

energy demand for primary power, which includes load cuts made during the year, amounted to 12,852,000,000 kilowatt-hours, as compared with 10,958,000,000 kilowatt-hours for the fiscal year ended October 31, 1946, an increase of 17.3 per cent.

Cuts in Power Deliveries 1946-47

In the winter of 1946-47 the curtailments of deliveries were of the order of 225,000 kilowatts (300,000 hp) at the time of peaks and only for a short time during the summer vacation period in the months of July and August was it possible to meet all primary demands over the daily peak load periods. However, at the time of the monthly peak demands in July and August the cuts were 62,000 kilowatts (83,000 hp) and 110,000 kilowatts (147,000 hp) respectively.

Increase in Demand Exceeds Capacity Added

The second unit at DeCew Falls came into operation in time to be of service when the customary winter increase in load took place but the growth in demand had already exceeded the capacity added with the result that the load cuts in October, November and December of 1947 exceeded the cuts for the same months in 1946.

Conservation Essential

At the approach of the fall and winter months of 1947, with the continued rise in power demands an appeal was made to domestic consumers not to waste electricity, in order to make power available for the production of food and basic commodities and to help maintain employment at its present desirable level throughout the Province. Notwithstanding this appeal the unavoidable curtailment in the delivery of power and energy to large industrial users became more serious and on November 10, 1947, in order to relieve the situation a modified system of power rationing was introduced. This together with the continuation of a vigorous campaign for domestic conservation of power enabled the Commission to deliver to industries an estimated 60,000 to 90,000 kilowatts (80,000 to 120,000 hp) more than otherwise would have been possible.

Maintenance and Rehabilitation

THE POST-WAR program of maintenance and rehabilitation of plants has been handicapped by the continued high demand for power which has made it difficult to release any part of the overburdened plants for repairs. It has also been slowed to some extent by a continued short supply of materials. Only the most urgent part of the program was undertaken in 1947.

Modifications and rehabilitation of many transmission facilities and transformer stations were made during 1947. These extensive changes together with increased transformer capacities provided more stable operating conditions for many system and municipal stations. Increased capacities were provided in the following places.

Increased Capacity of Transformer Stations, 1947

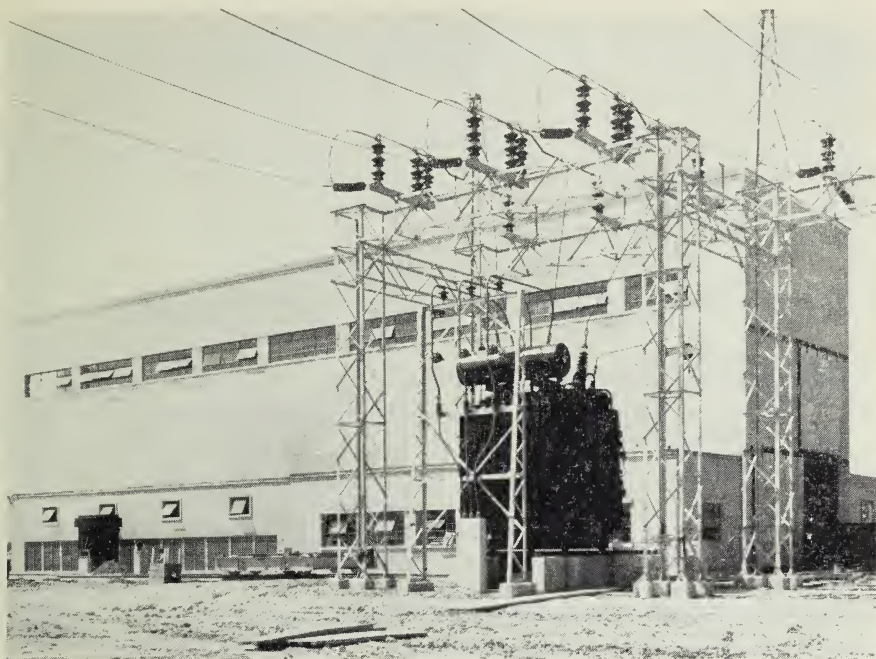
Location of station	Increased capacity Kva	Location of station	Increased capacity Kva
Aldershot D.S. No. 2 (new)...	2,000	Millbrook D.S.	100
Alexandria D.S. No. 2 (new)...	600	Minden D.S.	275
Alliston D.S. No. 2 (new)....	750	Morrisburg D.S.	450
Alvinston D.S.	150	New Hamburg D.S.	550
Ancaster D.S.	400	Oakville D.S.	300
Appin D.S. (new)....	1,000	Oil Springs D.S.	450
Apple Hill D.S.	150	Ostrander D.S. (new)....	1,000
Arnprior D.S.	1,500	Pelham D.S.	375
Atwood D.S. (new)....	1,000	Penetanguishene D.S.	600
Aylmer D.S.	1,250	Penetanguishene D.S. No. 1...	600
Bass Lake D.S. (new)....	600	Perch D.S.	550
Big Chute D.S.	100	Perth D.S.	1,150
Bleazard Valley D.S. (new)....	600	Peterborough R.S.	175
Bolton D.S.	300	Port Dalhousie D.S. (new)....	1,000
Cainsville D.S. No. 2 (new)...	450	Port Perry D.S.	300
Caledonia T.S. (new)....	8,000	Riverdale T.S. (new)....	15,000
Camp Borden D.S.	50	Rondeau D.S.	550
Clinton D.S.	550	Russell D.S. (new)....	1,500
Comet D.S.	550	St. Catharines T.S.	8,000
Connaught D.S.	775	St. George D.S.	300
Decewsville D.S.	300	St. Marys T.S.	3,750
Delhi D.S.	1,250	Stoney Creek D.S.	400
Dunbarton D.S. (new)....	600	Streetsville D.S.	1,250
Fonthill D.S.	550	Unionville D.S. (new)....	600
Fort Frances D.S. (new)....	300	Uxbridge D.S. No. 1	150
Frankford D.S. No. 2		Uxbridge D.S. No. 2 (new)....	300
(Sills Island G.S.)....	150	Wallaceburg D.S.	1,500
Galt D.S.	550	Wallaceburg R.S.	150
Harriston D.S.	300	Walkerville D.S. No. 2 (new)..	1,000
Hepworth D.S.	100	Wasdells R.S.	550
Holyrood D.S.	400	Watford D.S. No. 2	150
Kincardine D.S. No. 2	300	Wellesley D.S.	300
Kirkfield R.S. No. 2 (new)....	300	Willowdale D.S.	1,000
Lambton D.S. (temporary)...	1,874	Wilsonville D.S.	400
Linden D.S.	300	Winchester D.S. No. 2	1,000
Madoc D.S.	300	York T.S.	15,000

Rural Electrical Service

THE RECORD for the fiscal year ended October 31, 1947, is recorded briefly in the following paragraphs:

At the end of the year there were nearly 196,500 rural consumers of all classes supplied through rural operating areas served by 24,400 miles of rural line.

Despite the shortages of materials and men which pervaded all phases of the Commission's construction activities, 21,000 new consumers were served and 1,000 miles of primary line were built. Of the new consumers, 17,300 received service from existing lines.



Modern building and outside electrical installation at the new Scarborough 25,000-kva, 25-60 cycle frequency-changer station adjacent to Toronto.



Tunnel exit and construction equipment at Aguasabon 55,000-horsepower development on the north shore of Lake Superior.

The aggregate of the monthly peak loads recorded for all rural operating areas reached a new maximum in October, 1947, of 146,625 kilowatts (195,500 hp), an increase of 20 per cent.

In previous years the maximum aggregate power sold in rural areas occurred during the summer months of July or August. In the latter part of the summer of 1947, however, so rapidly were customers being added to the rural lines that the usual drop in load, following the exodus from summer resorts, was more than counter-balanced by the increased demand of permanent residents in rural areas. The peak of 146,625 kilowatts established in October compares with 142,120 kilowatts in August which itself was 19 per cent higher than the previous summer's peak.

At the end of October, 1947, there were on hand and in immediate prospect some 35,900 rural applicants requiring service in 1948. To serve part of this group, it would be necessary to construct 5,300 miles of new primary line. The remainder would be connected to existing lines. The objective of the Commission is to serve some 30,000 new consumers during 1948 and to construct 3,400 miles of new rural lines. The rural program also includes a large number of improvements to increase the capacity of existing lines, an essential prerequisite to further extensions and the taking on of additional customer loads.

The greatly increased number of consumers on existing lines, while it presents some difficult problems of line capacity, will greatly assist to maintain, during the present period of higher costs, the low uniform rates established.

The Commission considers it very important to the economy of the Province to extend electrical service to as many farms as is possible. One of the principal reasons for this extensive rural construction program is to encourage the farmer to improve his production in the face of extremely adverse labour conditions. A further reason which has been basic with the whole rural program is to raise the farmer's standard of living and lighten his labour.

1947 Financial Operating Results

THE COMMISSION experienced another successful financial year in 1947 which was the result of a ready market at all times for its available power output. Consequently, despite the general trend of economic conditions which necessitated price increases for goods and services of so many kinds, there was no need in 1947 to consider an increase in electric rates.

However, the circumstances which have enabled the Commission to report successful financial operating results during recent years under prevailing rates are not expected to continue indefinitely. Operating records show that the Commission is at present securing its maximum revenue to date per unit of plant; thus a temporary situation has developed within the last few years whereby increasing revenues have not been accompanied by corresponding increases in operating expense. This condition will change as new units of plant are brought into service and essential reserve capacities have once more become established.

Financial operating statements of the Commission will appear as usual in the Annual Report.

Personnel Activities

IN THE reorganization, a greatly expanded personnel department has been developed with the direct intention of placing an increasing emphasis on personnel relations. One of the major responsibilities of the Personnel department throughout 1947 was securing of men for the large construction projects. During most of the year, labour both skilled and unskilled was in high demand which made it difficult both to obtain and to hold a sufficient number of workers at the major projects. A number of camp personnel superintendents were recently appointed to aid in the handling of these conditions.

The number of employees of the Commission increased from 8,980 to 13,090 in the past year. In the same period the staff of the Construction department, which is included in the above total, increased from 2,916 to 6,314; this accounted for 83 per cent of the total increase in staff.

The staff of the Commission is now represented in management-employee relations by two separate groups and relations have been maintained on a cordial and satisfactory basis. The Federation of Employee Professional Engineers and Assistants (Unit No. 1) embraces all employees engaged in non-supervisory professional engineering work, and the Employees Association of The Hydro-Electric Power Commission of Ontario represents all other non-supervisory employees including technicians, clerks, trades workers, operators, regular employees of the Construction department, etc.

Expanding activities and staff increases have made necessary an enlargement of personnel in the Medical section. The staff now includes a medical director, a part-time doctor at head office, and a full-time doctor at the Des Joachims development. A modern hospital was erected at Des Joachims and a second one is under construction at Pine Portage.

The Linemen's School operated at full capacity last year and the Training section generally reports substantial achievement. Sixty rural foremen were given a two weeks' course at the training centre in Toronto which stressed supervisory duties, job relations, planning and laying out work and instructions and training in job skills. The three-year program for operators in training was maintained through the year. Safety training was carried on by visits to actual jobs in connection with accident prevention work.

Research and Testing

THE RESEARCH and Testing laboratories of the Commission are continuously preoccupied with many of the problems inherent in the development and administration of a large power supply system. In the construction field these problems relate chiefly to the maintenance of quality in the various structures and equipment used. In the operating field they are concerned with undesirable conditions, hazards, limitations and obstructions. Laboratory investigations by their control of quality and the elimination of undesirable conditions aid greatly in the improvement and expansion of Hydro service.

In concrete research the Commission has been a leading investigator in Canada. A well-established procedure is now followed for each major hydro-electric develop-

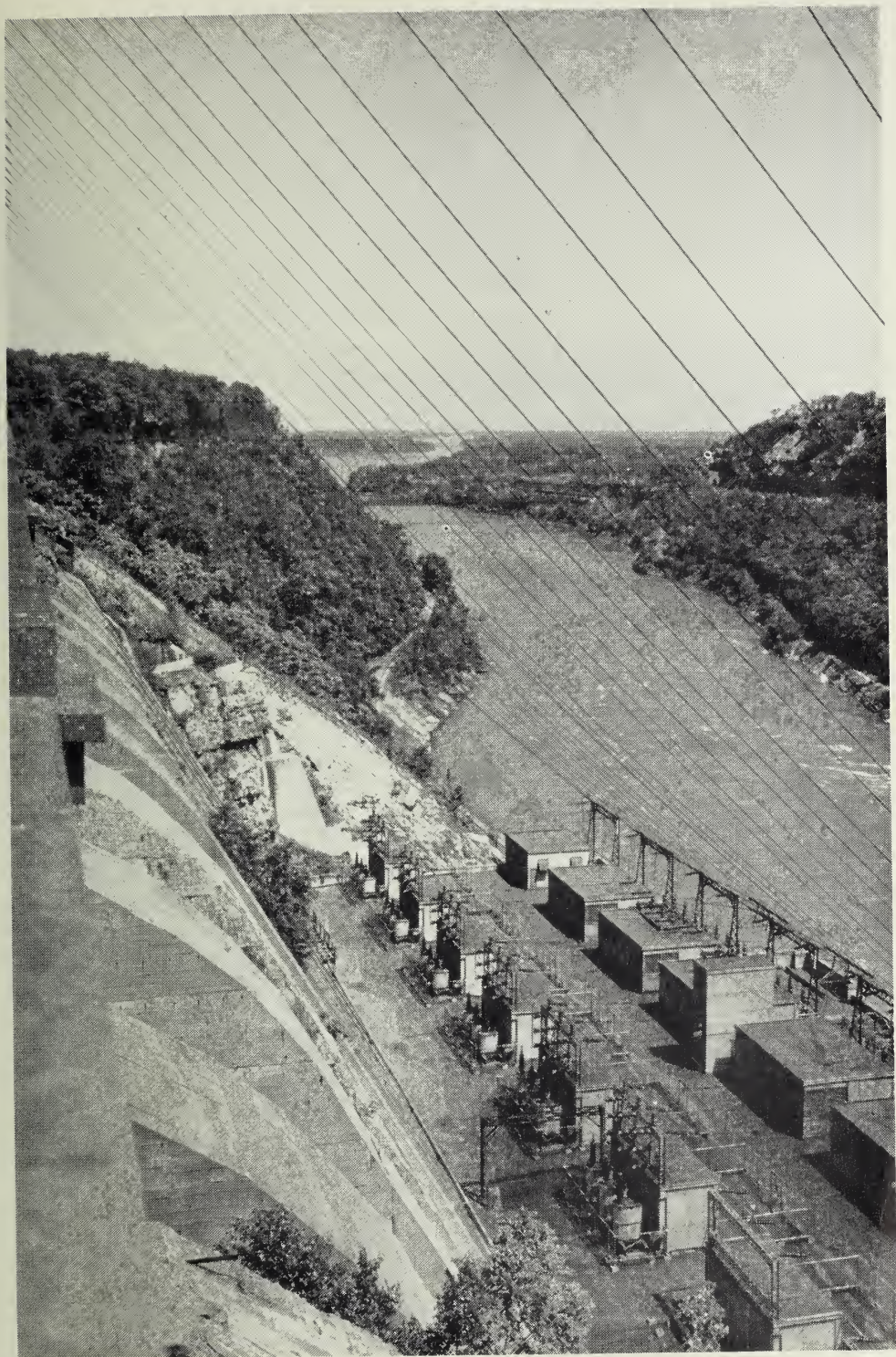
ment. Before construction starts field surveys locate adequate supplies of sand and stone whose satisfactory quality must be established by extensive acceptance tests. Next, proportioning tests are made to ensure accurate design of field mixes. During construction, supervision and testing ensure adequate field control of quality. Finally throughout the service life of a structure its condition is carefully studied and the information applied to ensure even more satisfactory results in future structures. Other research on concrete is directed to durability, expansion, volume changes, and the comparative value of several classes of plain and deformed reinforcing bars.

Other important research has related to the use of plywood form panels in connection with Bailey bridge structures for concrete forms in dam construction, methods of grouting the rock foundations beneath large dams, the engineering properties of soils, the chemical grouting of sands, and the study of seepage problems.

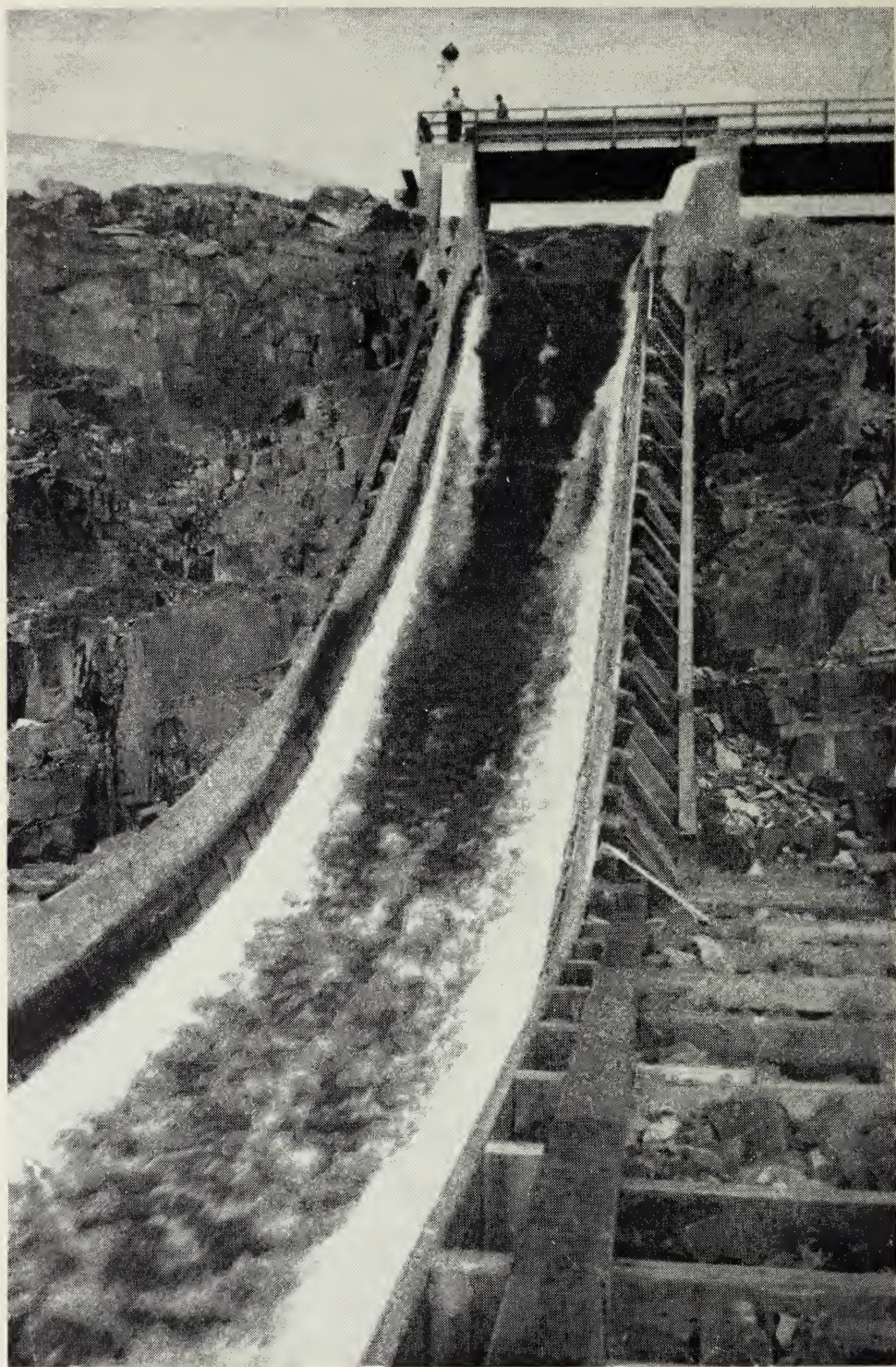
In connection with both maintenance and operating problems electrical devices of great ingenuity have been developed by the Commission's scientists and engineers. These result in better protection of equipment and in improved continuity of service.

To the engineering activities of the Commission, to which it is closely linked, research has made an important contribution in progress toward the goal of greatly expanded supplies of power and distribution facilities.





Looking down Niagara river from above powerhouse at Queenston



Log chutes such as this one at Alexander generating station on the Nipigon river are to be found at Hydro plants in territory where timber cutting operations are carried on

Are You Asking These Questions About Saving Electricity ?

IS IT STILL NECESSARY TO SAVE ELECTRICITY?

Yes. Not nearly enough saving is yet being made, especially in the home. Result, for some time past several large industries have had their power supply cut off for lengthy periods in the 24 hours.

IS IT NECESSARY TO SAVE ONLY AT CERTAIN HOURS?

No, it is vital to save at ALL hours. While electricity cannot be stored, water that generates it can be stored. The water storage for the five Hydro plants in the Niagara area is provided by the Great Lakes. This assures a continuous flow of water sufficient to enable these plants to operate 24 hours a day—still there is not enough power. In 48 other Hydro generating stations throughout Ontario the water supply must be very closely guarded—if too much electricity is demanded one day, the next day's power supply must suffer. This condition is aggravated by the abnormally low rainfall last Autumn.

MUST HOMES DO ALL THE SAVING?

Not by any means. ALL consumers must play their full part. Modified rationing has to some extent reduced the consumption of electricity in stores and by other commercial consumers, but still greater voluntary savings are urgently needed.

HOW CAN I SAVE MORE ELECTRICITY?

Don't leave lights burning in unoccupied offices. Turn idling motors off. Use range elements as short a time as possible. Turn off verandah and all other lights when not needed. Use electrically heated water sparingly. Do not use electric space heaters or grates.

Avoid All Waste — SAVE ELECTRICITY



THE HYDRO-ELECTRIC POWER COMMISSION
OF ONTARIO